

*Oliver Heaviside: Sage in Solitude: The life, work, and times of an electrical genius of the Victorian age:* P. J. NAHIN

(IEEE Press, 1988, 320 pp., £100.68 hardback)

This remarkable book, which encompasses the life and work of Oliver Heaviside (1850–1925) was written by an Associate Professor of Electrical Engineering, rather than by a professional historian, who would probably have found the bulk of Heaviside's ideas, papers and mathematics too difficult to deal with, although the mathematics included will be familiar to most graduates and undergraduates of electrical engineering.

Nevertheless, the book is not a dry resumé of technical work. The aura of the times, such as the squalor and class-ridden society of Victorian London, and the friendships, correspondence and conflicts between some of the great personalities of mathematical physics and electrical engineering are well captured.

Oliver Heaviside, the youngest of four sons, was born deaf to a poor couple in Camden Town, London, in 1850. Oliver only attended school until the age of sixteen, and left with little more knowledge of mathematics than algebra and trigonometry. By sheer chance, his mother's sister had, in 1847, married the famous electrical inventor, Charles Wheatstone (1802–1875), who greatly influenced the young Heaviside and inaugurated a two-year programme of self-education for him at home. He encouraged Oliver to learn Morse code, Danish and German and, later, used his influence to help Oliver to become a telegraph operator in Denmark at the age of eighteen. In 1871, Oliver became Chief Telegraph Operator in Newcastle due, no doubt, to Wheatstone's influence. Two of Oliver's older brothers also became involved with telegraphy.

In 1874, Oliver resigned from his job as chief telegraph operator and returned to London to live with (and off) his parents. He never took another job; his parents and brothers helped to subsidise his meagre earnings from his technical writings and a civil list pension which he received from 1896 on. Thus, was he able to carry out his great work in cable telegraphy and mathematical physics.

In his 1932 Kelvin lecture to the IEE, W. E. Sumpner said of Heaviside, 'He was a mathematician at one moment, and a physicist at another, but first and last, and all the time, he was a telegraphist!' The book describes how Oliver and his brother Arthur were not welcomed by the Society of Telegraph Engineers and Electricians (STE & E), the forerunner of the Institution of Electrical Engineers (IEE), because the IEE did not want telegraph clerks! In 1908, however, the IEE elected him an Honorary Member, in recognition of his great contributions and accomplishments, and, in 1922, they awarded him their highest award, the Faraday medal.

Heaviside's early telegraphy work, based on the earlier work of Sir William Thomson (Lord Kelvin 1824–1907); his bitter conflicts with and low opinion of William Preece (1834–1913), the Engineer-in-Chief of the British General Post Office, who was so scathing of the use of 'the abstruse language of mathematics' to solve problems in electrical science and cable telegraphy; his reformulation of the famous equations of the electromagnetic theory of James Clerk Maxwell (1831–1879), who was his hero; his non-rigorous operational calculus; his use of vector notation; his friends and enemies, contemporaries and fellow workers; and his final years as a hermit are all superbly described and documented.

Dr. Nahin devoted nearly all his free time for over six years to reading old books, old journals (such as *The Electrician*, *Nature* and *Philosophical Magazine*), and old letters (from 1890 onwards) in addition to communicating with countless people, in his quest to produce this gem of a book.

He would dearly love to have experienced just one day in the Victorian London of 1887 and to meet his hero, Ollie, to hear from his very lips what he thought of his principal adversary, the technically-weak William Preece. He does temper his hero-worship, however, when he reveals that

Heaviside had many flaws to his character. He was unsociable and not concerned to be popular, which probably stemmed from his traits of solitude and reclusiveness. He took little trouble to explain his theories, which were usually right, to persons less gifted than himself; his books and papers were very hard to understand and he shunned advice to make them more comprehensible. He was not sufficiently disciplined to become an academic and he was dismissed by many as an eccentric crank because of his behaviour; in particular, his regular tirades against the establishment. He was a perpetual complainer and irritated many by his blunt writing style. He was arrogant and probably had a superiority complex, which may be why he did not want to go to university.

The book is littered with photographs and quotations of the great men of electrical science, reprints from old letters and now defunct magazines and journals, reproductions of old advertisements for things no longer available, reproductions of pages from old notebooks and pictures and cartoons, humorous stories and comments and many more interesting features. It has a comprehensive index, a wealth of notes and references, and it is printed and produced in a style which makes it a pleasure to read.

How was it that a man, who had no formal education after the age of sixteen, could apply operational calculus to technological problems in a way that other eminent mathematical physicists had not? Why was a charged layer of the ionosphere named after him? The best way to gain an insight into the life and work of this eccentric genius will be to delve into this delightful book!

Dr. Nahin expresses apprehension as to how his book will be received and whether technical readers might just feel a little guilty at taking time to read such a book. As far as I am concerned, his efforts were more than worthwhile, because the book is a tribute to both Dr. Oliver Heaviside F.R.S. and Dr. Paul Nahin and it is a jolly good read! At this price (£100.68!!) it ought to be!!!

BRIAN M. SHAW, *Division of Electrical and Electronic Engineering, Hatfield Polytechnic*